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BLUE-GREEN ALGAE IN NECTAR OF *BANKSIA* aff. *SPHAEROCARPA*

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Inspection of numerous plants of the *Banksia* aff. *sphaerocarpa* R. Br. complex has shown that the nectar at the base of the flowers is invariably olive green (Fig. 1). This change from the original transparent, lemon colour occurs within one or two days of the flowers opening. As the

Fig. 1.—Flower head of *Banksia* aff. *sphaerocarpa* beginning to open. Already nectar at the base of the open flowers has turned dark green due to the presence of blue-green algae (arrow). Scale = 4 cm.

flowers age, the nectar becomes an almost black, gelatinous lump adhering to the base of the flowers. This phenomenon was observed in plants inspected at Armadale, Maddington, Kings Park (cultivated in the Botanic Garden), and in the vicinity of Geraldton and Walkaway.

Green nectar was most abundant on flower heads opening during fine weather following autumn showers a few days before (May-June). The dark mucilage usually formed a skin over the drop of nectar which remained liquid inside. With greater output, green nectar would flow over the flowers, down the leaves and stems and onto the ground. Nectar production fell during prolonged dry weather, and continual rain in later months washed off the nectar soon after exudation, so that in both cases little mucilage accumulated.

High power microscopic examination of the green, mucilaginous nectar revealed abundant filamentous and unicellular blue-green algae embedded in green mucilage. Pollen grains of *Banksia* aff. *sphaerocarpa* were always present. None had germinated, while bacteria often adhered to them.

Yeasts were sometimes observed, and these no doubt contributed to the 'musty' smell of the flowers. Some of the densely-packed, branching filaments lacked thick-walled heterocysts *(Nostochopsis?)*, while in others about 10% of the cells were heterocystous. Large, spore-like akinetes were abundant in old nectar. These were penultimate to a terminal heterocyst *(Cylindrospermum, Wollea?*, both common in soil) or less frequently, between two heterocysts *(Nostoc, Anabaena?*, both common in soil). Larger, multicellular hormogonia were sometimes seen.

Are these blue-green algae incidental in the nectar, or do they have some functional significance? The skin of mucilage would certainly reduce evaporation and hence prolong the attractiveness of the flowers via nectar and odour. Nevertheless, at least the Cannington form of this species complex is completely self-fertile, even in the absence of pollinators (Lamont, unpub.). These algae may even produce sufficient toxins (well-known in aquatic species) to deter animal visitors. On the other hand, the abundance of heterocysts indicates considerable potential for fixation of atmospheric nitrogen and its conversion into ammonia and thence amino acids. In this case, the nectar may be a valuable protein supplement, as well as energy source, for pollinators. In view of this species' highly infertile sandy (dry or winter-waterlogged) habitats, this unusual symbiosis may well have a more direct function: a source of supplementary nitrogen for the plant. Nitrogen compounds would be washed or carried soon after synthesis onto the mat of proteoid roots under the canopy. Even blue-green algae which will only fix nitrogen in the presence of fructose, a standard component of nectar, would be accommodated by this system. Further studies are continuing.

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LONG RANGE SIGHTINGS OF BUSH FIRES AS A POSSIBLE INCENTIVE FOR PLEISTOCENE VOYAGES TO GREATER AUSTRALIA

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Birdsell (1977) compares alternative Indonesian island routes (Figure 1, inset) possibly used by Pleistocene voyagers to Greater Australia and estimates the shortest seaway distances existing during glacial maxima at c. 20,000 and c. 53,000 yr BP, periods when the sea around northern Australia is estimated by Chappell (1976) to have been as much as 150 m below present sea level. Then and during the more frequent episodes over the past 120,000 years when sea level was 20-80 m below that of the present (cf. Chappell, 1976, Figure 1) smoke and glare of naturally caused bush fires on the exposed Sahul Shelf should have been visible from several